IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Docket No.: 31305
CAVE, Steven P.	
Application No.: 10/066,277	Group Art Unit No.: 2623
Filed: February 1, 2002	
AUTOMATED IMAGING SYSTEM AND METHOD FOR CONCRETE QUALITY ANALYSIS	Examiner: LAROSE, Colin M.

REPLY BRIEF

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Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

APPELLANT'S REPLY BRIEF

In response to the Examiner's Answer dated March 22, 2006, Appellant hereby submits a Reply Brief in accord with 37 C.F.R. § 41.37 and MPEP § 1208.

No fees are required for this Reply Brief. However, any fee which is due in connection with this Brief should be applied against our Deposit Account No. 19-0522.

Respectfully submitted,

By _____ for

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ATTORNEYS FOR APPELLANT

I. Status of Claims

This application was filed on February 1, 2002, with 42 claims, of which claims 1, 14, 23, and 34 were independent. A first Office Action was mailed November 26, 2004, in which claims 1–42 were rejected. In particular, claims 1–4, 6–8, 23–26, and 28 were rejected under 35 U.S.C. § 102(b) as being anticipated by Esrig, U.S. Patent No. 4,755,874; claims 5 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber, U.S. Patent No. 5,262,967; claims 17 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber, Wallack, U.S. Patent No. 6,748,110, and Mitsuyama, U.S. Patent No. 5,768,412; claims 9–11, 14–16, 18–20, 29–31, 34–36, and 38–40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack and Mitsuyama; claims 12, 21, 32, and 41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack, Mitsuyama, and Oosawa, U.S. Patent No. 6,151,408; and claims 13, 22, 33, and 42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack, Mitsuyama, and Cho, Feature Extraction using Fuzzy Relations for Objects of Various Shapes, IEEE 272 (1996).

In response, Appellant filed an amendment on February 28, 2005 amending claims 1, 14, 23, and 34 and arguing in favor of the amended claims.

In response to Appellant's amendment of February 28, 2005, the Examiner mailed a second, final, Office Action on June 30, 2005 ("OA"), again rejecting claims 1–42 on the same grounds as those set forth in the Office Action dated November 26, 2004.

In response, Appellant filed a Notice of Appeal on September 30, 2005, and an

Appeal Brief on December 30, 2005. The Examiner mailed a Reply Brief on March 22, 2006, reciting the same rejections set forth in the previous Office Actions and presenting arguments against Appellant's arguments set forth in the Appeal Brief.

Claims 1–42 are pending and the rejections of claims 1–42 are appealed.

II. Grounds for Rejections to be Reviewed on Appeal

1. Claims 1–4, 6–8, 23–26, and 28 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Esrig, U.S. Patent No. 4,755,874.
2. Claims 5 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber.
3. Claims 17 and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber, Wallack, and Mitsuyama.
4. Claims 9–11, 14–16, 18–20, 29–31, 34–36, and 38–40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack and Mitsuyama.

III. Arguments

In the Examiner's Answer dated March 22, 2006 (the "Answer"), the Examiner addressed five arguments asserted in Appellant's Appeal Brief. Responses to portions of the Examiner's comments are set forth below.

Argument 1

The Examiner argues that "Appellant's arguments hinge on the premise that Esrig's system can locate only defects in the interior of an IC under inspection, and any defects that may be present on the surface of the IC would go undetected," and that "Appellant has provided no persuasive evidence or rationale why Esrig's system is incapable of detecting surface defects on the top layer of an integrated circuit under inspection." (Answer, page 13). Appellant respectfully disagrees.

The defects detected by an automated process of Esrig are exclusively internal defects.

Appellant maintains that the only reasonable interpretation of Esrig is that the automated analysis disclosed therein only identifies internal dielectric defects of a device under test, and is not operable to identify a surface feature of the device under test.

The system disclosed in Esrig is designed to detect "current conduction through a damaged dielectric" (col. 1, lines 9–11). Thus, the detected current flows through the dielectric, not on a surface of the dielectric. The automated portion of the system of Esrig only detects defects through which current passes, which are exclusively internal to the IC device under test. As explained in the Appeal Brief, Esrig expressly teaches that emission microscopy (the technique used in the invention of Esrig) improves upon the "conventional

technique of stripping layers off of the DUT." (Col. 1, line 66–col. 2, line 2). Furthermore, Esrig repeatedly refers to defects "in" the IC device, not "on" the IC device. (*See, e.g.*, col. 2, lines 23, 41, 47).

Appellant further notes that while Esrig discloses use of both a reflected light image and an emitted light image, only the emitted light image is used to detect defects in the IC device under test. The reflected light image is a snapshot of a top of the chip and the emitted light image is created from light emissions resulting from electrical current flowing through defects in the dielectric. The system of Esrig improves upon the prior art by using an auxiliary camera to capture reflected light images. Esrig explains:

> The auxiliary camera is an ordinary high resolution video camera, without an image intensifier, which provides higher quality images, comparable to microscope eye piece images, side-by-side with the processed image on display 15, for the operator to better distinguish features.

(Esrig, col. 6, lines 49–54).

It is notable that the high-quality reflected light image is used by the operator only "in correlating defect locations to coordinates of the IC", wherein the operator can then refer to a "composite layout of the IC" to determine a "probable cause of failure." (Esrig, col. 1, lines 62–65, col. 6, lines 42–43). Thus, even though Esrig discloses use of an image of a top of the IC under test, there is no indication that the defects detected by the system of Esrig are visible or otherwise detectable from the top-view image. In fact, Esrig teaches that a reflected light image from "a corresponding second device" may be used instead of a reflected light image of the device under test. (Esrig, col. 6, lines 55–60). The defects are not detectable in the top-view image because they are not on the surface of the IC.

In view of these and other disclosures of Esrig, the only reasonable interpretation of Esrig is that the dielectric defects are exclusively internal to the IC device under test.

The Examiner's interpretation of the statement in Esrig that "defects wherever located in the chip can be discerned" is incorrect and takes the statement out of context

In arguing that the defects detectable by the system disclosed in Esrig may be "surface features," the Examiner quotes the statement that "defects wherever located in the chip can be discerned," recited in Esrig at column 5, lines 9–14. This statement, when considered in context, means that the system is operable to detect defects located at different coordinates or areas of the chip, not different depths of the chip. The text surrounding the quoted statement reads as follows:

> Then, after processing, the difference image is superimposed upon the previously stored reflected image to give a macro or "global" composed image in which defects wherever located in the chip can be discerned by the system operator. This global view eliminates the prior art necessity of repositioning the micro optics system and repeating the image capture, differencing and overlay steps for each sub-area potentially having a defect in the DUT. With this macro or global view, the operator can select possible defect bright spots in local area windows to zoom in on for closer inspection with the higher magnification micro optics system 40.

(Esrig, Col. 5, lines 9–22, emphasis added; *see also* col. 2, lines 22–29).

This text makes it clear that the invention disclosed in Esrig improves upon the prior art by enabling an operator to view an entire face of the chip at once without the need to view a first sub-area of the chip, then view a second sub-area of the chip, and so forth. Thus, this text does not teach or imply a particular depth at which a defect may be located, as suggested by the Examiner.

This statement is the only portion of the disclosure the Examiner cites to support the argument that the defects detected by the system of Esrig are "surface defects." The Examiner ignores the express disclosures of Esrig that teach away from such an interpretation, such as the disclosure that conventional techniques of locating the dielectric defects involved "stripping layers off of the DUT." (Esrig, col. 1, line 67–col. 2, line 1). Stripping layers off the IC would not be necessary, of course, if the defects were "surface features" as recited in claim 1.

For at least the reasons set forth above, the dielectric defects identified by the system of Esrig are not surface features, but are exclusively internal to the IC under test. Furthermore, if there were a defect on the surface of the IC under test, Esrig provides no automated method of detecting it. The reflected light image taught by Esrig may give some indication of surface features, but even if it did, the system disclosed in Esrig does not automatically process or analyze the reflected light image. Rather, an operator must view the reflected light image to determine a general location of a previously-detected dielectric defect.

The Examiner has failed to provide the necessary basis in fact or technical reasoning to support a rejection based on inherency.

Because Esrig does not teach "automatically conduct[ing] an analysis of the image to identify surface features," as recited in the independent claims, the feature must be inherent in Esrig in order for Esrig to properly be relied upon as a § 102(b) reference. However, the Examiner has not provided the requisite basis in fact or technical reasoning necessary to support a rejection based on inherency.

The MPEP states "[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." (2112.IV). Furthermore, To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (citations omitted); MPEP 2112.IV. "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original); MPEP 2112.IV.

The Examiner concedes that the defects detected by the system of Esrig exist on the interior of an IC, but argues that the defects may also be present on the surface of the IC. Esrig, however, indicates that the defects are internal to the IC, and the Examiner has provided no facts or technical reasoning to reasonably support the claim that the detectable defects may be on a surface of the IC. The only evidence cited by the Examiner that the detectable defects may be surface features was text from Esrig taken out of context, as explained above. Esrig, on the other hand, provides various indications that the defects are strictly internal to the IC. Esrig teaches, for example, that the prior art methods of finding such defects involve "stripping layers off of the DUT;" Esrig never uses

the word "surface;" and Esrig repeatedly refers to the dielectric defects "in" the IC and not "on" the IC. Esrig further teaches that a reflected light image of a top of the IC under test is used only to correlate defect locations to coordinates of the IC—not to detect or identify a defect.

Esrig does not teach or suggest automatically conducting an analysis of an image to identify surface features, but rather teaches identifying dielectric defects that are internal to an IC device under test. The Examiner is forcing Esrig to teach something that it clearly does not by arguing that such defects may be on a surface of the device. Thus, the Examiner's argument relies on inherency without providing the necessary basis in fact or technical reasoning to support the argument.

The Examiner's interpretation of the term "surface feature" would impermissibly give that term two different meanings in a single claim

A term that appears in more than one portion of a claim or claim set must generally be given the same meaning wherever it appears. *Schoenhaus v. Genesco*, No. 05-1278, slip op. at 5 (Fed. Cir. March 15, 2006) (holding that there is a "presumption that the same terms appearing in different portions of the claims should be given the same meaning unless it is clear from the specification and prosecution history that the terms have different meanings at different portions of the claims") (emphasis in original).

The Examiner argues that the defects detectable by the system disclosed in Esrig may be on a surface of a device and therefor would fall within the meaning of "surface features" as recited in claim 1. Even assuming a defect detectable by Esrig is on a surface of the device, such would not be a "surface feature" as recited in claim 1. If the phrase

"surface feature" in claim 1 were construed broadly enough to include defects in an IC that are only detectable by the emission of light generated by leakage current, the term "surface feature" would have two different meanings within claim 1 alone.

A first portion of claim 1 reads "a light source operable to illuminate the sample, wherein the illumination is provided at a grazing angle so as to enhance a contrast between surface features of the sample." (Emphasis added). Note that in this portion of claim 1, "surface features" are features that reflect incident light, otherwise illuminating the device at a grazing angle would not "enhance a contrast between surface features." Because the features reflect incident light, the features are detectable in a reflected light image of the surface. Note also that the surface features must be detectable in a reflected light image in order to identify the surface features by processing the image.

A second portion of claim 1 reads ". . . a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample . . ." (Emphasis added). The Examiner argues that this portion of claim 1 reads on Esrig's system of detecting dielectric defects in an integrated circuit device because the defects may be on a surface of the device. As explained above, Appellant strongly disagrees with the suggestion that the dielectric defects may be on a surface of the device. Even assuming such a defect is"on a surface" of the integrated circuit device, however, it is clear from the disclosure of Esrig that the defect would not reflect incident light or be detectable in a reflected light image of the surface. As explained above, for example, a detailed (microscope quality) reflected light image of the top of an IC device under test is used only to correlate previously-detected "defect locations to coordinates of the IC." (Esrig, col. 6,

lines 42–43). If the dielectric defects did reflect incident light and were detectable from a reflected light image, the operator would be able to identify or at least detect the defect using the reflected light image.

Therefore, the Examiner is attempting to force the term "surface feature" to include features that do not reflect incident light and that are not detectable in a reflected light image, which would give the term "surface feature" a first meaning in the first portion of claim 1 recited above and a different meaning in the second portion of claim 1 recited above.

Argument 4

The Examiner argues that the combination of Esrig and Jaber teaches or suggests "automatically conducting an analysis of a sample of concrete." (Answer, page 16). To support this argument, the Examiner cites Jaber at column 1, lines 6–9, column 2, lines 31–35, and column 5, lines 66–68. (*Id.*). These sections refer to, among other things, "a system and method for automatically determining the air-void or aggregate content of hardened concrete . . ." (Col. 1, lines 6–7).

The Examiner's argument fails to address the language of the application claims.

Claim 1 recites "a computing device operable to . . . store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample . . ." (Emphasis added). While Jaber discloses a system operable to automatically determine air-void or aggregate content of hardened concrete,

it is not operable to automatically identify surface features of the concrete. Rather, the system of Jaber relies on a user to identify air-voids and aggregates. (Col. 3, lines 65–68; col. 4, line 17, 56–59; col. 5, lines 11–15, 40–43). Thus, Jaber clearly does not teach or suggest an automated process to "substantially automatically conduct an analysis of the image to identify surface features of the sample." The combination of Jaber and Esrig does not teach or suggest this limitation because, for the reasons set forth above, Esrig also fails to teach or suggest automatically conducting "an analysis of the image to identify surface features of the sample."

The Examiner's application of In re Venner is incorrect and ignores past decisions by the Board of Patent Appeals and Interferences.

The Examiner argues that "even if one were to consider Jaber's system not to be automated, such a deficiency would not render the proposed combination of Esrig and Jaber invalid" because "it has been judicially recognized that providing means to automate a manual activity that accomplishes the same result is not sufficient to distinguish over the prior art," citing *In re Venner*, 120 U.S.P.Q. 192 (CCPA 1958) and MPEP 2144.04. (Answer, page 16).

First, the Board of Patent Appeals and Interferences has set bounds to the application of *Venner* that the Examiner has clearly breached. For example, the Board has held that there "must be some evidence to show the simplicity of converting a particular operation. The mere allegation that it can be done is not convincing." *Ex parte Carlson*, 2000 WL 33256844 at *3 (Bd. Pat. App. & Interf. 2000). In the present case the Examiner has certainly not demonstrated that converting the manual process of identifying relevant

surface features of a sample of concrete to an automated process would be "simple."

Furthermore, in *Ex Party Richard Brouillet*, 2001 WL 1339914 at *2 (Bd. Pat. App. & Interf. 2001), the Board held that failure to establish that the prior art method "accomplishes the same result" was fatal to a rejection based on *Venner*. In the present case, the Examiner has failed to demonstrate that the prior art manual method disclosed in Jaber accomplishes the same result as the automated process of the application invention. The automated process of the application invention does not accomplish the same result as the manual process disclosed in Jaber because, for example, the automated process "provides more consistent results than existing means." (Application, page 4, lines 2–5).

Second, the court in *In re Venner* noted that the various aspects of the invention were known in the art, such as "the need for withdrawal of the middle core section upon solidification" and "timing devices used in conjunction with pressure valves to cause the withdrawal of various parts at predetermined times after pouring in the operation of molding devices." *Venner*, 120 U.S.P.Q. at 194. The court further noted that "[t]he timer itself does not compute the molding period. A mental process is invoked and the timer is set accordingly. Patentability cannot be predicated upon a mental step." *Id.* (citing *In re Shao Wen Yuan*, 89 U.S.P.Q. 324, 188 F.2d 377).

In contrast to the timer at issue in *Venner*, the computer program of the present invention does perform computations, including analyzing an image to identify surface features. In other words, while the timer of *Venner* merely repetitively performed a single task with a single outcome each time without receiving any information as an input, the

computer program of the application invention receives and acts on information (images of concrete) to generate a different outcome in each analysis.

The Examiner has not shown that the manual prior art process accomplishes the same result as the automated process of the present invention, nor has the Examiner demonstrated that converting the manual process to an automated process would be a simple matter. Furthermore, the invention at issue in *Venner* was a non-computational, simple mechanical device that was a mere combination of known elements, while the application invention involves a optics and image processing software for analyzing concrete samples not known in the art.

Conclusion

For at least the reasons set forth above, the system of Esrig automatically detects only internal dielectric defects and is incapable of detecting surface features. Furthermore, the combination of Jaber and Esrig fails to teach or suggest "automatically conducting an analysis of the image to identify surface features," as recited in claim 1, but discloses automatically analyzing information about voids and aggregates manually collected and submitted by an operator.

Any additional issues raised by the Examiner's Answer are fully addressed in the Appeal Brief and require no further comment or argument by the Appellant. Should any questions remain, please contact the undersigned.

Respectfully submitted,

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